

RIGID HULL INFLATABLE BOAT WITH FOAM INSERT

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of co-pending Application No. 10/047,428, filed
5 January 14, 2002, priority from the filing date of which is hereby claimed under
35 U.S.C. § 120, which prior application claims the benefit of U.S Provisional
Application No. 60/261,350, filed January 12, 2001, and which applications are
incorporated herein by reference.

FIELD OF THE INVENTION

10 The present invention relates to boats that are stabilized with buoyant stabilizing
members. Specifically, the present invention relates to boats that have rigid hulls and an
inflatable collar with a foam insert stabilizing member attached to the sides of the hulls
and extending substantially around the perimeter of the hulls.

BACKGROUND OF THE INVENTION

15 It is very important to design smaller boats with flotation devices in the hull to
ensure that the boat remains floating in case substantial water gets into the boat or the
boat capsizes. Additionally, flotation devices provide the boat with added buoyancy, thus
increasing carrying capacity and safety. The installation of flotation devices is especially
important in the case of small boats that are designed for operation on rough waters, such
20 as in the case of rescue boats.

Many prior art boat designs incorporate foam devices within the hull of the boat,
as in U.S. Patent No. 4,060,865 (Woolworth). Typically, the foam flotation members are
incorporated directly within the hull structure itself. These boat designs are generally
safer than designs that do not incorporate flotation devices within the hull.

Other prior art boat designs use inflatable cylinders to form the sides of the boat, as in the case of Zodiac® boats. The inflatable cylinders provide a high degree of stability to the boat, but result in a loss of performance. Generally, prior art inflatable boat designs use inflatable cylinders as the sides of the boat and either a flexible
5 floorboard or a rigid floorboard formed of wood or fiberglass. In operation, the cylinders serve as the running surface for the boat and remain in contact with the surface of the water; thus, a substantial wetted surface area and a significant amount of drag are created. This design also results in a very poor ride due to the fact that the boat tends to skip or bounce over the top of the waves. In addition, the inflatable cylinders are easily damaged
10 and must constantly be inspected for tears, leaks, etc. Another disadvantage to inflatable boats is that typically the interior of the boat is very small, thus leaving little room for carrying equipment or passengers.

Another prior art design is a boat stabilized through the use of outboard foam stabilizing members. Generally, such prior art designs use a rigid, planing hull having a
15 transom and a pair of curved sides extending forwardly from the transom to form the bow of the watercraft. The sides and bottom of the hull are joined to form a chine. Foam stabilizers for stabilizing the watercraft are mounted on the sides of the hull above the chine and extend from the transom along the length of the hull to the bow. The stabilizers extend outwardly from the sides of the hull so that they contact and displace an increasing
20 volume of water as the boat lists. A disadvantage of such foam-stabilized boats is that the foam stabilizers are harder than the prior art inflatable boats with inflatable cylinders at the sides.

SUMMARY OF THE INVENTION

The present invention provides a safe, stable, high performance boat while
25 reducing the disadvantages of prior art designs. The present invention's use of a rigid, planing boat hull combined with an exterior inflatable collar partially filled with foam results in these advantages without the disadvantages of typical inflatable boat designs. Furthermore, the inflatable collar is substantially out of contact with the surface of the water when the boat is at cruising speed. This decreases the wetted surface area of the
30 boat when compared to inflatable boat designs, thus increasing performance. An auxiliary planing strake can also be provided for use as a running surface when a sharp turn is performed at high speed.

The present invention allows the inflatable collar to be mounted to the sides of the boat hull in such a way that water pressure at high speeds does not force the inflatable collar away from the boat hull, thus preventing damage to the boat hull or inflatable collar. Furthermore, the inflatable collar is mounted to the hull without holes being formed in the sides of the boat, thus ensuring that mounting the inflatable collar on the hull does not create a possibility of leaks into the interior of the boat.

An embodiment of an inflatable collar with foam inserts watercraft includes a rigid, planing hull having a transom and a pair of curved sides extending forwardly from the transom to form the bow of the watercraft. The sides and the bottom of the hull are joined to form a chine. A single continuous inflatable collar with foam inserts for stabilizing the watercraft is mounted on the sides of the hull above the chine and extends continuously from the transom along the length of the hull to the bow and back to the transom along the opposite side of the hull. The inflatable collar extends outwardly from the sides of the hull so that it contacts and displaces an increasing volume of water as the boat lists. This stabilizes the boat by increasing the righting moment of the hull. The watercraft may include a flange that extends outwardly from the sides of the hull. The flange is adapted to extend below the inflatable collar to ensure that water does not flow between the inflatable collar and the sides of the hull.

The above and other features of the invention, including various novel details of construction and accommodation of parts, will now be more particularly described with reference to the accompanying drawings. It will be understood that the particular device embodying the invention is shown by way of illustration only, and not as a limitation of the invention. Principles and features of this invention may be employed in various and numerous embodiments without departing from the scope of the invention.

25 BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing aspects and many of the attendant advantages of this invention will become more readily appreciated as the same become better understood by reference to the following detailed description, when taken in conjunction with the accompanying drawings, wherein:

30 FIGURE 1 is a first embodiment of a watercraft stabilized by an inflatable collar partially filled with foam inserts;

FIGURE 2 is a cross-sectional view of the inflatable collar with foam insert of FIGURE 1;

FIGURE 3 is a cross-sectional view of another embodiment of the inflatable collar with foam inserts;

5 FIGURE 4 is a cross-sectional view of a third embodiment of the inflatable collar with foam inserts; and

FIGURE 5 is a cross-sectional view of a fourth embodiment of the inflatable collar with foam inserts.

DETAILED DESCRIPTION

10 OF THE PREFERRED EMBODIMENT

Referring to FIGURES 1 and 2, an embodiment of a watercraft 1 stabilized by an inflatable collar 20 partially filled with foam inserts 21 is disclosed. In the first embodiment disclosed, the watercraft 1 includes a rigid hull 2 and single inflatable collar 20 located on both sides of the hull. The rigid hull 2 may be formed of aluminum,

15 fiberglass, Kevlar®, or any other suitable material that can withstand the harsh and corrosive environment encountered by boat hulls. In the embodiment shown, the hull 2 is designed to be a high-performance boat hull. The hull 2 includes a transom 3 that defines the stern of the boat, two sides 6 extending forward from the stern and curving toward each other to define the bow 8 of the boat hull, and a bottom 9. In the embodiment

20 shown in FIGURES 1 and 2, the sides 6 are joined to the bottom 7 of the boat and to the sides 4 of the transom 3 such that hard chines 10 are formed at the intersection between the sides 6 and the bottom 9 of the boat 1. A hard chine is formed when two discrete surfaces meet at an angle, as opposed to a soft chine where the chine is part of a gradually curving surface, such as the surface of a number of sailboat hulls. In the embodiment

25 shown, auxiliary planing strakes 11 extend outwardly and downwardly from the bottom 9 of the hull 2 near chines 10. The outwardmost edges 12 of the auxiliary planing strakes 11 curve downwardly. Auxiliary planing strakes 11 downwardly deflect water or debris thrown off by the bottom 9 of the hull 2 as the boat 1 moves through the water, thereby protecting the inflatable collar 20 from damage. In order to increase safety while

30 gaining unique performance advantages, an inflatable collar 20 with foam inserts 21 is mounted to the sides 6 of the hull 2 above the chines 10. Mounting the inflatable collar 20 above the chines 10, as opposed to at or below the chines, creates a number of

advantages as explained below. The inflatable collar 20 extends from a point rearward of the transom 3 forward along one of the sides 6 of the hull 2 to the bow 8 of the boat, and then extends rearward along the opposite side of the hull, as is best shown in FIGURE 1. The inflatable collar 20 may include rear extensions 22 that extend rearwardly beyond the
5 transom 3 in order to provide additional lift in head and following seas, thus increasing the stability of the boat 1. Although it could be advantageous to extend the inflatable collar 20 beyond the transom 3, it will be understood that it is not a required aspect of the present invention to do so.

In the embodiment shown in FIGURE 2, the inflatable collar 20 is substantially
10 cylindrical in cross section. Other embodiments of the collar 20 are shown in FIGURES 3 and 4. The inflatable collar 20 includes a unitary outer cover 23, attachment mechanism 24, and multiple air bladders 25 contained within the outer cover. The attachment mechanism 24 for the inflatable collar 20 includes upper 26 and lower 27 extruded attachment fittings attached to each side 6 of the hull 2. In an embodiment, the
15 extruded attachment fittings 26 and 27 are made of aluminum, but may be formed of fiberglass, Kevlar®, or any other suitable material that can withstand the harsh and corrosive environment encountered by boat hulls. In an embodiment of the invention in which the hull 2 and extruded attachment fittings 26 and 27 are aluminum or another metal, the extruded attachment fittings are attached by welding. Suitable attachment
20 techniques are known to those skilled in the art with respect to nonmetal hulls or extruded attachment fittings. Each extruded attachment fitting 26 and 27 runs continuously from the transom 3 to a point several inches from the stem of the bow 8. In the embodiment shown, the upper extruded attachment fittings 26 on each side 6 of the hull 2 are mounted so that their upper surface 28 is flush with the tops 13 of the sides 6 of the boat, while the
25 lower extruded attachment fittings 27 are mounted several inches above the chine 10. The extruded attachment fittings 26 and 27 include lipped channels 29, as shown in FIGURE 3. The ends of the lipped channels 29 at the transom 3 are permanently blocked off, while the ends of the lipped channels near the bow are blocked by any suitable removable fitting.

30 The outer cover 23 is made of polyurethane or any other flexible material that can withstand the harsh and corrosive environment encountered by boat hulls. The outer cover 23 of the inflatable collar 20 includes flaps 30 of material disposed on the inward

side of the inflatable collar. The flaps 30 are wrapped around ultra high molecular polyethylene rods 31, and the combination of rod and flap material is sized to slide in the end of the extruded attachment fittings 26 and 27, but is too large to pull through the open sides of the lipped channels 29. The inflatable collar 20 may be placed on the hull 2 by 5 removing the removable fitting blocking the forward end of the lipped channels 29, sliding the rods 31 and attached flap 30 material down the length of the lipped channels, and closing the forward end of the channel by replacing the removable fitting.

Referring to FIGURE 4, the inflatable collar 20 and flaps 30 can be sized and positioned so that when the collar is inflated, it will protrude above the gunwales 14, 10 providing a wide and comfortable sitting location. The inflatable collar 20 and flaps 30 can also be sized and positioned so that the collar is in contact with the water when the vessel is not underway, or positioned so that the collar is not in contact with the water when the vessel is not underway.

Referring to FIGURES 2-3, the inflatable collar 20 is further fitted with one or 15 more internal air bladders 25. The internal air bladders 25 are made of any air- and watertight flexible material that can withstand the harsh and corrosive environment encountered by boat hulls, such as polyurethane. Each internal air bladder 25 further includes a resealable air valve 32 that can be used for inflating or deflating the air bladder. Each internal air bladder 25 is further fitted with a foam insert 21 so that the 20 inflatable collar 20 retains some capacity to displace water in the event that the internal air bladders 25 lose air- and watertight integrity. In the embodiment shown in FIGURE 3, the foam insert 21 is held in position within the internal air bladder 25 by a panel 33 of the material used to form the air bladder. The outer cover 23 optionally 25 includes zipper 34, which can be opened to permit the easy removal and/or replacement of the air bladders 25. Removal of the air bladders 25 reduces the width of the boat 1, permitting easier over-the-road transport. As another alternative, air bladders 25 can be drained of air through resealable air valve 32 to also reduce the width of the boat 1, whether or not the outer cover 23 is fitted with zipper 34.

The reserve buoyancy foam insert 21 can be formed of any suitable buoyant foam 30 that can withstand the harsh environment encountered by a high-speed watercraft, including normal docking and moorage bumping. It is also advantageous that the foam insert 21 be formed from a foam that does not absorb water, has some memory, and is

low in density. In the preferred embodiment shown, a closed-cell polypropylene or polyethylene foam having a density of 1.7 pounds per cubic foot is used to form the foam insert 21. In view of currently available foam, it is believed that an optimum range of densities is from approximately 1-3 pounds per cubic foot. Advances in technology may 5 result in lower density foam that can be employed in the invention. The foam insert 21 in the current embodiment is sized to displace one-half to two-thirds of the volume of water displaced by an intact internal air bladder 25. However, the foam insert 21 can be sized to provide any fraction of displacement relative to an intact internal air bladder 25, but should be sized so that the boat 1 retains a sufficient righting moment for its intended 10 purpose, even when the internal air bladders have lost their water- and air-tight integrity. The foam inserts 21 may also be sized to provide the boat 1 with sufficient buoyancy to ensure that the boat will float even if filled with water or capsized.

Placing the inflatable air collar 20 above the chine 10 of the hull 2 also creates performance advantages. The use of a rigid planing hull 2 in the present invention allows 15 the inflatable collar 20 to be lifted substantially out of contact with the surface of the water during high-speed operation. This greatly reduces the wetted surface area and, therefore, the drag of the boat 1. Furthermore, the foam insert 21 allows the boat 1 to retain a high degree of stability in the event the air bladders 25 lose water- and air-tight integrity. The illustrative embodiment is also ideally suited for use in locations where the 20 boat 1 may come into contact with other objects. In those circumstances, the inflatable collar 20 will deform without damaging the object that has been struck or injuring any persons who have been struck.

Referring to FIGURE 5, another embodiment is shown wherein the hull 2 is a catamaran. In the embodiment shown, the inflatable air collar 20 is mounted to the 25 outwardmost side of each hull sponson 15 above the static waterline 16. As with the inflatable air collar 20 mounted to the mono-hull, the collar can otherwise have any of the embodiments described above.

It is understood that the present invention is by no means limited to the particular construction herein disclosed and/or shown in the drawings, but also comprises any 30 modifications or equivalents within the scope of the disclosure.

While the preferred embodiment of the invention has been illustrated and described, it will be appreciated that various changes can be made therein without departing from the spirit and scope of the invention.